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Authority 775004

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Aberdeen Proving Ground

MARYLAND

FIRST REPORT ON MOUNTING OF FOUR 75 MM RIFLES ON
40 MM GUN MOTOR CARRIAGE M19

DECLASSIFIED
DOD Dir. 5200.9, Sept. 27, 1958 AND
NCWN by JRM date 26/7/69

REPORT 225-109 SET 00-1

THIRD REPORT ON ORDNANCE PROGRAM NO. 5697

1st Rept OP-6013

ORDNANCE RESEARCH CENTER

PROJECT NO. 6226-I

001
400-12/480

400.112/480

31.51 Fort Monroe—4-29-44—10,000

~~CONFIDENTIAL~~

ORDNANCE RESEARCH & DEVELOPMENT CENTER

ABERDEEN PROVING GROUND, MARYLAND

DATE: 26 FEBRUARY 1946

FIRST REPORT ON MOUNTING OF FOUR 75 MM RIFLES ON 40 MM GUN MOTOR CARRIAGE M19

and

FIRST REPORT ON ORDNANCE PROGRAM NO. 6013

FIRST REPORT ON ORDNANCE RESEARCH & DEVELOPMENT PROJECT NO. 6226-I

INCLUSIVE DATES OF TEST 25 June-3 Dec 45

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D Correspondence

BY: J. W. BEACH
Proof Director

CONFIDENTIAL

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Project 6-22-24
BEACH/acd

SECTION I - Introduction

1. The inherent characteristics of recoilless weapons made possible a great increase in the fire power available for some of the lighter standard Ordnance vehicles. This development was revolutionary in that it made such weapons as a 75 mm rifle practical for vehicles as light and mobile as the Cargo Carrier M29.

2. The weight advantage gained by using recoilless weapons to achieve a given fire power led to the suggestion by the Director of the Ordnance Research & Development Center at Aberdeen that a complete battery of 105 mm Recoilless Rifles be incorporated on a suitable vehicle. The advantages of mobility, concentration of offensive power, reduced size of crew, and centralization of control make the military advantages of such a vehicle apparent, especially for such conditions as found on some of the islands of the Pacific Theater.

3. Because no 105 mm Recoilless Rifles were available at this time, it was decided to mount four 75 mm Recoilless Rifles T21 in a cluster to test the feasibility of a multiple unit on one vehicle. A modified Twin 40 mm Gun Motor Carriage M19 was chosen as a suitable vehicle for this test as it offered the possibility of mounting the weapons in a group on the modified Twin 40 mm Gun Mount M12.

4. As finally worked out, individual rifle supports permitted separate rifle alignments which allow the weapons to be concentrated at will on point targets or aimed for a normal spread. The electrical fire control permits one gun to control the direction of fire in both elevation and azimuth. Safety switches are included in the firing circuit to prevent uncontrolled functioning of the weapons while the loader or gunner is within the danger area to the rear of the guns.

SECTION II - Objectives of Test

1. This test was conducted at the Ordnance Research & Development Center to determine mount stability and dispersion characteristics.

SECTION III - Conclusions

1. On the basis of tests conducted at the Ordnance Research & Development Center, and contained herein, it is concluded that:

a. The mount is feasible for multiple installation of 75 mm Recoilless Rifles T21.

b. Dispersion characteristics of the experimental Multiple 75 mm Rifle Mount is satisfactory.

c. Each rifle of this mount will have to be zeroed-in by firing instead of boresighting them on the same point.

d. A multiple mount of this type is worthy of further development.

SECTION IV - Recommendations

1. On the basis of tests conducted, it is recommended that:

a. The electrical firing system be redesigned to provide volley or ripple firing with appropriate safety measures.

b. Elevation safety stops be incorporated to prevent premature firing while the rifles are in line with vehicle restrictions.

c. Deflection and elevation adjustments be redesigned to facilitate proper adjustment and locking when zeroing-in the rifles.

d. The rear sector of the turn table be removed to permit greater elevation.

e. Stowage for 100 additional rounds be incorporated in the vehicle chassis.

f. A pilot production vehicle be constructed for Service Board Tests.

SECTION V - Details of Test

1. Description of Materiel.

a. The four 75 mm Recoilless Rifles T21 were installed in a cluster on the Mount M4 (T12) of the Twin 40 mm Gun Motor Carriage M19 within the original trunnion supports as shown by Automotive Drawings CV 276 A and B, entitled "Multiple 75 mm Gun Motor Carriage Based on Twin 40 mm Gun Motor Carriage M19", inclosed in Appendix C. The weapons are mounted on a 1" x 1" angle frame with gun trunnion supports to permit individual adjustment. The weapon cluster has a spread of 16" and they are separated horizontally 13".

b. The top two weapons are mounted approximately 5" forward of the two bottom weapons. This staggering of the weapons permits all four breech blocks to be open simultaneously and also affords balance to the mount.

c. The original Twin 40 mm Mount M4 (T12) was modified by the addition of a gear train to bring the traverse handwheel to the left side of the gun, thus permitting one gunner to control the direction of fire. See Automotive Drawings CV 276 A and B.

d. Four ammunition racks were added to the periphery of the gun mount as illustrated by APG Photograph Numbers A29588 and A29589. Three ammunition racks are mounted on the right side and one on the left side to provide sixty-four ready rounds.

e. The mount is equipped with four firing solenoids wired to permit ripple or salvo firing. They are connected directly with the mechanical firing mechanism of each weapon. Sighting of the unit is accomplished by Telescope Sight T126E2.

2. Procedure.

a. Dispersion firing tests were conducted by the Arms and Ammunition Division to determine firing characteristics. Previous to salvo firing for determination of dispersion, the rifles were checked for bore alignment and average recoil length. Measurements were taken from a pendulum test mount.

b. Dispersion firing was conducted at 1100 yards range on a 16' x 16' vertical target. After one rifle had been boresighted on the center of the target, it was assumed that the other three rifles would also be zeroed-in. After firing a salvo, the points of impact indicated that the weapons would have to be zeroed-in separately by firing.

c. Seven salvo groups were fired after a check of the weight of the propelling charges and projectiles. Immediately before firing each group, the fuzes of the projectiles were dipped in different colored paint to identify the dispersion of each weapon and the overall dispersion of the unit. The results of six salvos revealed a maximum dispersion of approximately 3.1 mils vertically by 3.7 mils horizontally, although the average dispersion for each rifle is approximately 2.1 mils vertically by 1.5 mils horizontally. The average probable error is approximately .6 mils vertically and .4 mils horizontally. (Ninth and Final Memorandum Report, dated 5 Dec. 1945.)

d. Movies of the last three salvos fired during these firing tests disclosed time loss in mechanical linkage and a slight differential in time of energizing the solenoids which obviates synchronous firing. Part of the difference in time of energizing the solenoids was caused by the gunner due to the individual firing switch for each weapon; it is improbable that any gunner can depress the firing switches simultaneously. (The same difficulty was also experienced during dispersion firing tests as described in the Third Memorandum Report, dated 3 August 1945.)

e. When the four 75 mm Recoilless Rifles T21 are fired in salvo, it is practically impossible to determine when a misfire occurs. If the trigger has notfunctioned, the loader cannot open the breech and the weapon is therefore safe. If, however, the trigger mechanism has functioned, the breech can be opened. The possibility of a misfire during a volley therefore should preclude all salvo firing. It is therefore believed that ripple fire should be substituted for salvos. The present firing circuit can fire the rifles consecutively but the use of individual switches for the solenoids forces the loader to remove his hand from the traverse wheel.

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Project 6-22-24
BEACH/acd

Authentication

APPROVED:

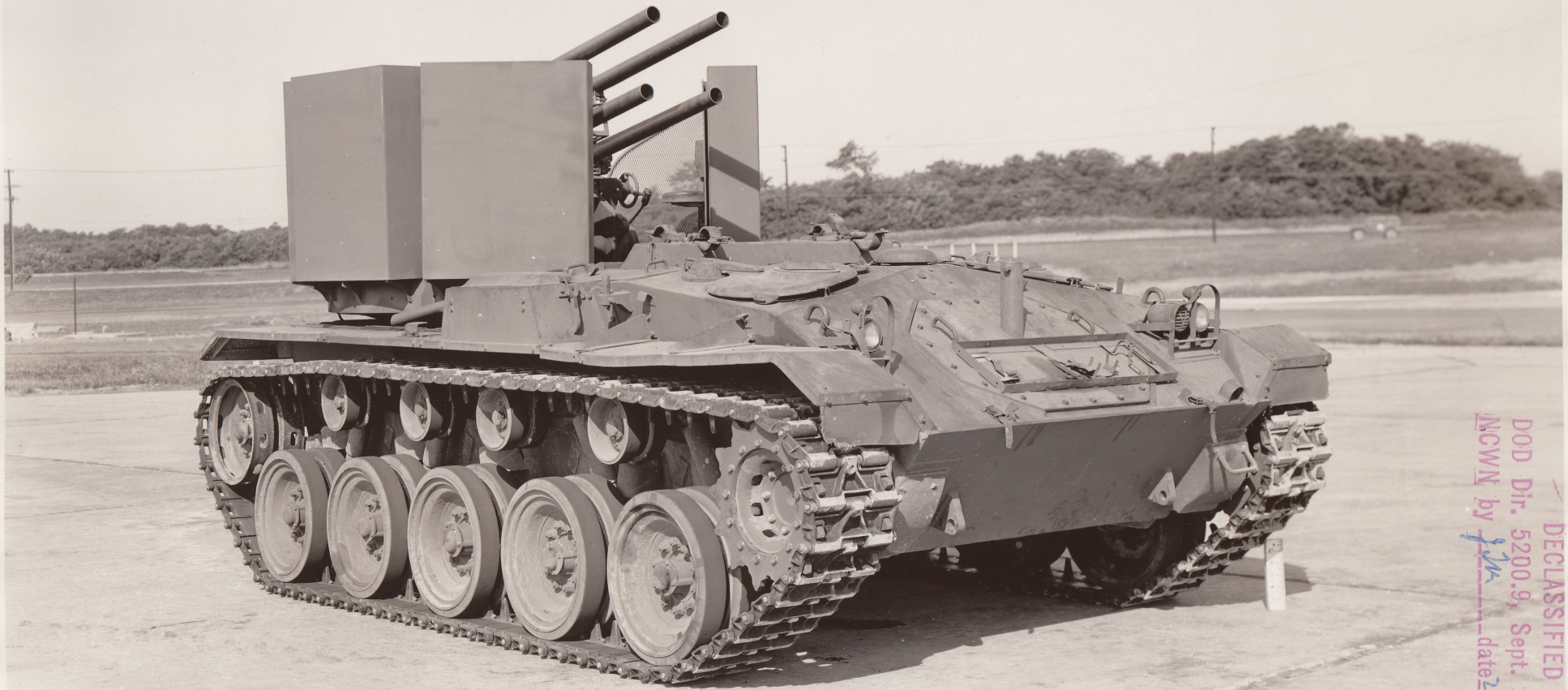
W. E. Becker
Colonel, Ordnance Department
Chief, Development & Proof Services
Ord. Res. & Dev. Center

J. W. Beach
J. W. Beach
Proof Director

E. Gray
E. Gray
Lt. Col., Ord. Dept.
Chief, Automotive Division

APPENDIX A

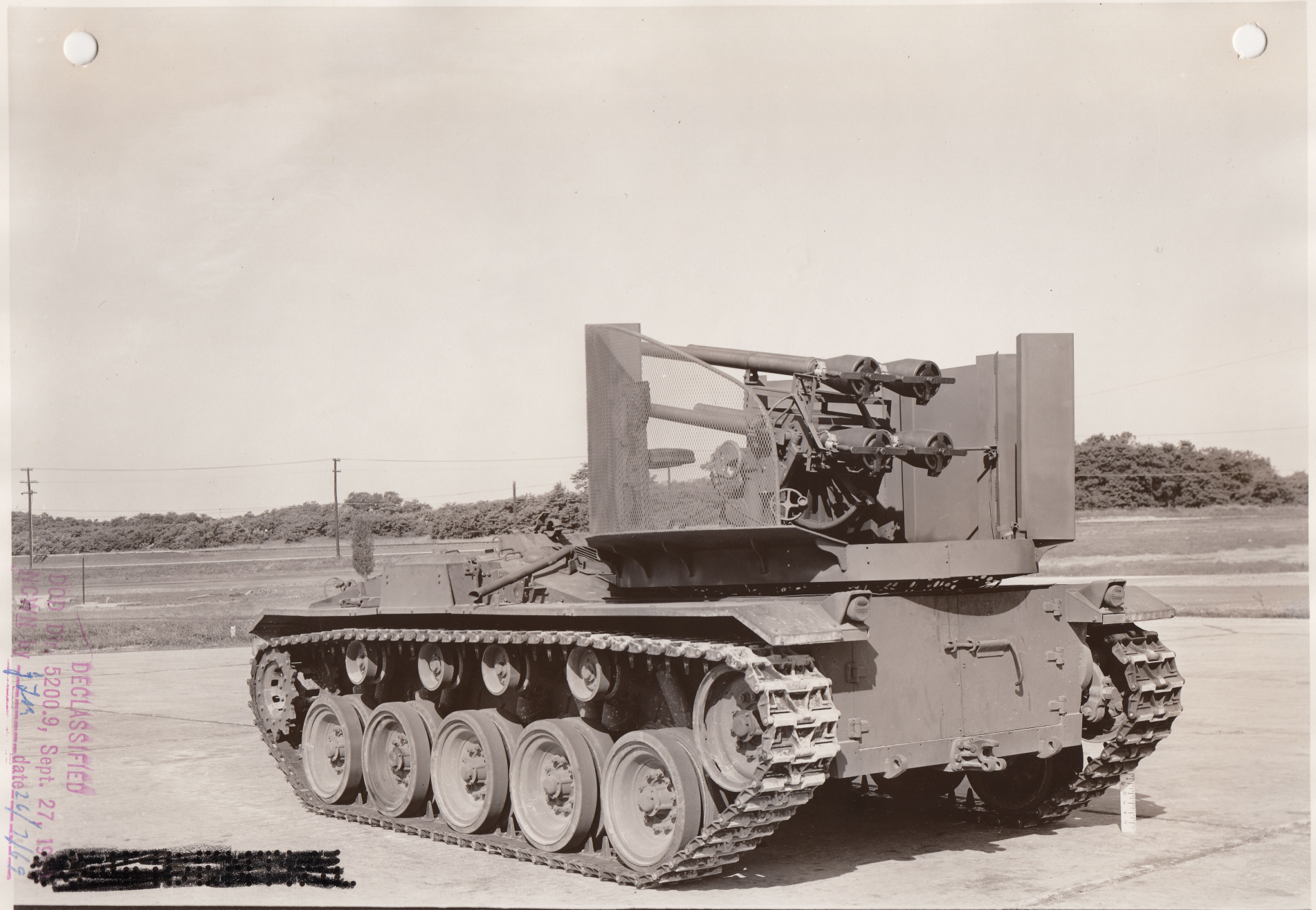
PHOTOGRAPHS



A29588 11 Jul 45 | ABERDEEN PROVING GROUND | ORDNANCE DEPT.

Project No. 6226/6-22-24. Installation of Four 75 mm Rifles T21, on the 40 mm Gun Motor Carriage M19.
Right front view.

DECLASSIFIED
DOD Dir. 5200.9, Sept. 27, 19
NCWN by ____ date 4/7/



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DoD Dir 5200.9, Sept. 27, 19
NCMA By ltr
date 2/7/12

A29589 11 Jul 45 | ABERDEEN PROVING GROUND | ORDNANCE DEPT.

Project No. 6226/6-22-24. Installation of Four 75 mm Rifles T21, on the 40 mm Gun Motor Carriage M19. Left rear view.

APPENDIX B

MEMORANDUM REPORTS

ABERDEEN PROVING GROUND, MARYLAND

AUTOMOTIVE DIVISION
ORDNANCE RESEARCH CENTER
& Dev.

CONFIDENTIAL

Project #6-22-24
WEPSALA/plh
Ext. 5293

FIRST MEMORANDUM REPORT

DATE 5 July 1945

TO: & Dev.		
T.A.C. PROJECT NO.	ORDNANCE RESEARCH CENTER PROJECT NO. 6226-I	A.P.G. FILE Verbal Orders Maj. Gen. Barnes
DATES OF TEST 25 June - 4 July 1945	LAST REPORT DATED ----	
TEST OF Mounting of Four 75 mm. Rifles on 40 mm. Gun Motor Carriage M19		
O.P. 5697	VEHICLE NO.	SHEET NO. 1
OPERATIONS SUPERVISED BY: L. B. Hopkins, Lt. Col., Ord. Dept.		

I. AUTHORITY

1. The authority for mounting four 75 mm. Rifles T21 on a 40 mm. Gun Motor Carriage M19 was given verbally by Major General Barnes.

II. SUMMARY OF ACTIVITIES

1. The weapons and all auxiliary equipment on the mount of the 40 mm. Gun Motor Carriage M19 were removed to permit the installation of four 75 mm. Rifles T21. Construction was initiated on the cradle to support the recoilless rifles within the trunnions of the 40 mm. mount.

III. DISCUSSION

1. In order to mount the four 75 mm. Rifles T21 on the 40 mm. Gun Motor Carriage M19, it was necessary to completely strip the 40 mm. gun mount of the weapons, power drive units, armor shields, and 40 mm. ammunition boxes. The 40 mm. gun mount trunnions and manual elevation and traversing gear boxes were maintained to provide the foundation for the new mount.

2. The four 75 mm. Rifles T21 are being mounted in a cluster with two rifles located between the 40 mm. gun mount trunnions and two directly above. Individual support cradles have been constructed for each of the rifles to permit boresight alignment adjustments. Those individual cradles will be attached to the trunnions and elevating rack of the 40 mm. mount by suitable supports. An attempt is being made to carry the traversing drive of the gun platform to the elevation tracker on the left side of the mount so that one gunner can control the direction of fire. Handwheels rather than the cranks now on the mount will be utilized. The elevation handwheel will be equipped with a firing button connected to the guns through a switch box which will permit either individual orsalvo fire.

3. Five individual ammunition stowage racks have been constructed to provide eighty 75 mm. rounds. These stowage racks will be attached to the periphery of the gun platform; three on the right side and two on the left. Approximately 120° of the periphery of the mount will be kept clear to the rear of the rifles for the blast. A gate will be attached between the ammunition stowage racks and the gun mount trunnions so that personnel cannot be to the rear of the weapons with the gates closed. A firing interrupter switch will be constructed into the hinges of both mounts so that the weapons cannot be fired with the gates open.

IV. DETAILED RECORD OF ACTIVITIES

1. 25 June 1945.

a. The mount on the 40 mm. Gun Motor Carriage M19 was removed.

b. Initial layout drawings were prepared for the installation of four 75 mm. Recoilless Rifles T21.

2. 26 June 1945.

a. The armor shields, ammunition stowage boxes, power traversing elevation motor were removed from the 40 mm. gun mount.

b. Construction of support cradles for the recoilless rifles was initiated.

3. 27 June - 4 July 1945.

a. Gun mount construction was continued.

b. 40 mm. Gun Motor Carriage M19 was being repaired.

L. B. Hopkins
Lt. Col., Ord. Dept.
Chief, Combat Vehicle Br.
Automotive Division

ABERDEEN PROVING GROUND, MARYLAND

Project #6-22-24
WEPSALA/plh
Ext. 5293

AUTOMOTIVE DIVISION
ORDNANCE RESEARCH CENTER
& Dev.

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SECOND MEMORANDUM REPORT

DATE 21 July 1945

TO: & Dev.

T.A.C. PROJECT NO.	ORDNANCE RESEARCH CENTER PROJECT NO. 6226-I	A.P.G. FILE Verbal Orders Maj. Gen. Barnes

DATES OF TEST 5 - 18 July 1945	LAST REPORT DATED 25June - 4 July 1945

TEST OF Mounting of Four 75 mm. Rifles on 40 mm. Gun Motor Carriage M19

O.P. 5697	VEHICLE NO.	SHEET NO. 1

OPERATIONS SUPERVISED BY: L. B. Hopkins, Lt. Col., Ord. Dept.

I. SUMMARY OF ACTIVITIES

1. The installation of four 75 mm. Rifles T21 on the mount of the Twin 40 mm. Gun Motor Carriage M19 has been completed. Functional firing tests consisting of 24 rounds have been conducted.

II. DISCUSSION

1. The four 75 mm. Rifles T21 were installed on the mount of the Twin 40 mm. Gun Motor Carriage as shown in APG Photographs Nos. A29588 and A29589, inclosed. The weapons are mounted in a cluster of four within the original trunnion supports for the 40 mm. weapons. The original mount was modified to permit one gunner to control the direction of fire. This was accomplished by the addition of a gear train to bring the traverse handwheel to the left side of the gun trunnions. Four ammunition racks were added to the periphery of the gun mount--three on the right side and one on the left--to provide 64 ready rounds for the two loaders. The mount was equipped with four firing solenoids wired to permit either individual or salvo fire. The firing circuit was fitted with two safety switches which were operated by the loaders. The firing circuit could not be completed unless both loaders were out of the danger area created by the blast of the rifles. A more detailed discussion of the construction will be forwarded together with the drawings which are being prepared.

2. A total of 24 rounds of Shell, HE, T38 has been fired from the mount to date. Further firing tests will be conducted to determine the accuracy of fire from the installation as completed.

III. DETAILED RECORDTOF ACTIVITIES

1. 5 - 11 July 1945.

a. The gun mount construction was completed.

b. Solenoid firing circuits and safety gates added.

c. The ammunition racks were installed.

2. 12 July 1945.

a. The M19 was delivered to "D" Field, Edgewood Arsenal.

b. Eight rounds of Shell, HE, T38 were fired from the mount.

3. 13 - 14 July 1945.

a. Eight rounds of Shell, HE, T38 were fired from the mount.

4. 15 - 18 July 1945.

a. Vehicle brought back to the OR&DC.

b. Mount inspected and prepared for dispersion firing tests.

L. B. Hopkins
Lt. Col., Ord. Dept.
Chief, Combat Vehicle Br.
Automotive Division

2 Incls.
Incl. 1. APG Photo #A29588
Incl. 2. APG Photo #A29589

ABERDEEN PROVING GROUND, MARYLAND

AUTOMOTIVE DIVISION
ORDNANCE RESEARCH CENTER
& Dev.

Project #6-22-24
WEPSALA/plh
Ext. 5293

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THIRD MEMORANDUM REPORT

DATE 3 August 1945

TO: & Dev.

T.A.C. PROJECT NO.	ORDNANCE RESEARCH CENTER PROJECT NO. 6226-I	A.P.G. FILE Verbal Orders Maj. Gen. Barnes
DATES OF TEST 19 July - 3 August 1945	LAST REPORT DATED 5 - 18 July 1945	
TEST OF Mounting of Four 75 mm. Rifles on 40 mm. Gun Motor Carriage M19		
O.P. 5697	VEHICLE NO.	SHEET NO. 1

OPERATIONS SUPERVISED BY: L. B. Hopkins, Lt. Col., Ord. Dept.

I. SUMMARY OF ACTIVITIES

1. Dispersion firing tests of the four 75 mm Rifles T21 on the Twin 40 mm Gun Motor Carriage M19 have been conducted. Drawings of the installation are being prepared.

II. DISCUSSION

1. For the purpose of dispersion firing tests, the four rifles on the subject mount were boresighted to intersect at the same target at 1000 yards. This was done to provide accurate control of direct fire from each of the weapons using the Telescope T126E3, which is mounted coaxially. It was necessary to vary the boresight adjustment of the two upper weapons and the lower right weapon slightly after firing the initial rounds to bring the impact of the rounds to the sight; this was necessary as the center of the sight is approximately 12" lower than the upper weapons and 24" to the left of the right hand bank. By aligning all four weapons with the sight, concentrated pin point firing can be achieved. However, this type of alighment will not provide the spread of fire utilized by field artillery battery to provide barrage fire. If desired, the weapons can be adjusted to provide a 100 yard spread at 1000 yards--one rifle will be left aligned with these sights. This alignment of weapons has the obvious disadvantage of requiring correction for three of the rifles when firing against point targets. However, the possibilities of adjustment are built into the mount so that the individual commanders may adjust their weapons as desired.

2. The initial dispersion checks were conducted at a range of 500 yards using Shell, Inert, T38, ST/C, with dummy fuze, Lot #13-2-I. The overall dispersion results of the firing are summarized in Table I, inclosed. The overall dispersions are recorded to show the maximum vertical spread obtained during firing; the weighted average dispersions would, of course, be less. The individual

rifle overall dispersions at 1000 yards are also included in Table I.

3. The proof officer was unable to land four rounds on the 12 foot target during salvo or volley fire. Three rounds registered consistently from a salvo of four at both 500 and 1000 yards. The overall group of three rounds measured as follows:

Salvo Grouping

Range	Mils Vertical	Mils Horizontal
500	1.3	1.1
1000	0.7	1.6

Following the volleys, each of the rifles was fired individually to check its adjustment relative to the sight; and in each case, accurate fire was obtained. It was impossible to determine which of the rifles was shooting high (no rounds fell short on any volley) in salvo fire. The inability to lay four rounds on the target during salvo fire may be due to one of two reasons or both:

a. The rifles utilized on the mount were installed as received by the Automotive Division without any attempt to mount rifles which had given equal recoil during proof acceptances. The gun books show that the four rifles installed on the mount had given 9, 10, 11, and 12 inches average recoil on the proof acceptance pendulum. This variance in performance characteristics may be sufficient to cause the high round. The upper right weapon which gave the largest vertical dispersion, as shown in Table I, is also the rifle which was most poorly balanced; i.e., 12" recoil.

b. The rifles may not be firing simultaneously, although the solenoids are energized at the same instant. The solenoids act against the trigger with the safety cammed over to the firing position. The actual travel of the solenoid plunger to fire the weapon may vary slightly between rifles so that one of the weapons is fired slightly later than the other three.

4. When the four rifles are fired in salvo, it is impossible to detect whether a misfire occurs. If the trigger mechanism has not functioned, the loaders cannot open the breech and they are, therefore, safe; but if the trigger mechanism has functioned and the round has not fired, the breech can be opened. The possibility of a misfire during a volley, therefore, should preclude all salvo firing. It is the opinion of observers that ripple fire should be substituted for volleys to prevent mishaps caused by misfires. With the present firing circuit, the gunner can fire the rifles in ripple fashion by consecutively throwing the individual rifle firing circuit switches. However, the use of these switches

forces him to remove his right hand from the traverse handwheel. The use of an automatic electrical ripple firing switch such as that used in multiple rocket launchers is being investigated.

III. DETAILED RECORD OF ACTIVITIES

1. 20 July 1945. Vehicle delivered to Edgewood for firing test.

2. 21 - 23 July 1945. Dispersion firing test conducted at "H" Field, Gunpowder Neck.

3. 24 July 1945. No activity.

4. 25 July 1945. Vehicle returned to the Automotive Shop for check of the solenoids and electric firing switches.

5. 26 - 27 July 1945. No activity.

6. 28 - 31 July 1945. Firing circuit being checked by the Armament Unit.

7. 1 - 3 August 1945. a. Drawings of the installation being prepared.

b. Rocket Division was contacted to obtain a synchronous motor type ripple firing switch which could be used in conjunction with the 24 volt system necessary to activate these solenoids.

L. B. Hopkins
Lt. Col., Ord. Dept.
Chief, Combat Vehicle Branch
Automotive Division

1 Incl.
Table I

ABERDEEN PROVING GROUND, MARYLAND

AUTOMOTIVE DIVISION
ORDNANCE RESEARCH CENTER
& Dev.

Project #6-22-24
WEPSALA/bjl
Ext. 5293

CONFIDENTIAL

FOURTH MEMORANDUM REPORT

DATE 13 August 1945

TO: & Dev.

T.A.C. PROJECT NO.	ORDNANCE RESEARCH CENTER PROJECT NO. 6226-I	Verbal Orders A.P.G. FILE Maj. Gen. Barnes
DATES OF TEST 4 - 10 August 1945	LAST REPORT DATED 19 July - 3 August 1945	
TEST OF Mounting of Four 75 mm. Rifles on 40 mm. Gun Motor Carriage M19		
O. P. 5697	VEHICLE NO.	SHEET NO. 1

OPERATIONS SUPERVISED BY: L. B. Hopkins, Lt. Col., Ord. Dept.

I. SUMMARY OF ACTIVITIES

1. Drawings are being prepared of the installation of the four 75 mm. Rifles T21 on the Twin 40 mm. Gun Motor Carriage M19.

L. B. Hopkins
Lt. Col., Ord. Dept.
Chief of Combat
Vehicle Branch
Automotive Division

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ABERDEEN PROVING GROUND, MARYLAND

AUTOMOTIVE DIVISION
ORDNANCE RESEARCH CENTER
& Dev.
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Project #6-22-24
HPSALM/ajl
Ext. 5293

MEMORANDUM REPORT

DATE 25 August 1945

TO: & Dev.

T.A.C. PROJECT NO.	ORDNANCE RESEARCH CENTER PROJECT NO. 6226 - I	A.P.G. FILE Verbal Orders Maj. Gen. Barnes
DATES OF TEST 11 - 24 August 1945	LAST REPORT DATED 4 - 10 August 1945	
TEST OF Mounting of Four 75 mm Rifles on 40 mm Gun Motor Carriage M19		
O. P. 5697	VEHICLE NO.	SHEET NO. 1

OPERATIONS SUPERVISED BY: L. R. Hopkins, Lt. Col., Ord. Dept.

I. SUMMARY OF ACTIVITIES

1. The Multiple 75 mm Gun Motor Carriage has been turned over to the Arms and Ammunition Division for firing tests. Drawings of the installation of the four 75 mm Rifles T21 on the Twin 40 mm Gun Motor Carriage M19 have been completed. The drawings - Auto Drawing No. CV276 - will be inclosed with the formal report on this project.

L. R. Hopkins
Lt. Col., Ord. Dept.
Chief, Combat Vehicle Branch
Automotive Division

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ABERDEEN PROVING GROUND, MARYLAND

AUTOMOTIVE DIVISION
ORDNANCE RESEARCH CENTER
& Dev.

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Project 16-22-24
WEISAAA/tjl
Ext. 5293

SIVM

MEMORANDUM REPORT

DATE 4 September 1945

TO: & Dev.

T.A.C. PROJECT NO.	ORDNANCE RESEARCH CENTER PROJECT NO. 6220-1	A.P.G. FILE Verbal Orders Maj. Gen. Barnes
DATES OF TEST 25 - 31 August 1945	LAST REPORT DATED 11 - 24 August 1945	
TEST OF Mounting of Four 75 mm Rifles on 40 mm Gun Motor Carriage M19		
O. P. 5697	VEHICLE NO.	SHEET NO. 1

OPERATIONS SUPERVISED BY: L. B. Hopkins, Lt. Col., Ord. Dept.

I. SUMMARY OF ACTIVITIES

1. The Arms and Ammunition Division of the Ordnance Research and Development Center is conducting firing tests of the Multiple 75 mm Gun Motor Carriage.

L. B. Hopkins
Lt. Col., Ord. Dept.
Chief, Combat Vehicle Branch
Automotive Division

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ABERDEEN PROVING GROUND, MARYLAND

AUTOMOTIVE DIVISION
ORDNANCE RESEARCH CENTER
& Dev.

Project #6-22-24
WFSALA/bjl
Ext. 5293

CONFIDENTIAL

SEVENTH MEMORANDUM REPORT

DATE 14 September 1945

TO: & Dev.

T.A.C. PROJECT NO.	ORDNANCE RESEARCH CENTER PROJECT NO. 6226-I	A.P.G. FILE Verbal Orders Maj. Gen. Barnes
DATES OF TEST 1 - 14 September 1945	LAST REPORT DATED 25 - 31 August 1945	
TEST OF Mounting of Four 75mm Rifles on 40mm Gun Motor Carriage M19		
O. P. 5697	VEHICLE NO.	SHEET NO. 1

OPERATIONS SUPERVISED BY: L. B. Hopkins, Lt. Col., Ord. Dept.

I. SUMMARY OF ACTIVITIES

1. The Arms and Ammunition Division of the Ordnance Research And Development Center is conducting firing tests of the Multiple 75mm Gun Motor Carriage.

L. B. Hopkins
Lt. Col., Ord. Dept.
Chief, Combat Vehicle Branch
Automotive Division

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ABERDEEN PROVING GROUND, MARYLAND

AUTOMOTIVE DIVISION
ORDNANCE RESEARCH CENTER
& Dev.

Project #6-22-24
WEPSALA/plh
Ext. 5293

CONFIDENTIAL

EIGHTH MEMORANDUM REPORT

DATE 1 October 1945

TO: & Dev.

T.A.C. PROJECT NO.	ORDNANCE RESEARCH CENTER PROJECT NO. 6226-I	A.P.G. FILE Verbal Orders Maj. Gen. Barnes

DATES OF TEST 15 - 30 September 1945 LAST REPORT DATED 1 - 14 September 1945

TEST OF Mounting of Four 75mm Rifles on 40mm Gun Motor Carriage M19

O.P. 5697	VEHICLE NO.	SHEET NO. 1

OPERATIONS SUPERVISED BY: L. B. Hopkins, Lt. Col., Ord. Dept.

I. SUMMARY OF ACTIVITIES

1. The Arms and Ammunition Division of the Ordnance Research & Development Center conducted firing tests of the Multiple 75 mm. Gun Motor Carriage. The firing report has not as yet been received.

L. B. Hopkins
Lt. Col., Ord. Dept.
Chief, Combat Vehicle Branch
Automotive Division

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ABERDEEN PROVING GROUND, MARYLAND

Project 6-22-24
REMERT/acd
Ext. 2293

AUTOMOTIVE DIVISION
ORDNANCE RESEARCH CENTER
and Development

CONFIDENTIAL

NINTH AND FINAL **MEMORANDUM REPORT**

DATE 5 Dec. 1945

TO:

T.A.C. PROJECT NO.	ORDNANCE RESEARCH & D.C. PROJECT NO. 6226-I	A.P.G. FILE	Verbal Orders Maj. Gen. Barnes

DATES OF TEST 1 Oct. - 3 Dec. 1945	LAST REPORT DATED 15 - 30 September 1945

TEST OF Mounting of Four 75 mm Rifles on 40 mm Gun Motor Carriage M19

O.F. 5697	VEHICLE NO.	SHEET NO. 1

OPERATIONS SUPERVISED BY: L. B. Hopkins, Lt. Col., Ord. Dept.

I. SUMMARY OF ACTIVITIES

1. The Arms and Ammunition Division of the Ordnance Research & Development Center has completed firing tests of the Multiple 75 mm Gun Motor Carriage.

II. DISCUSSION

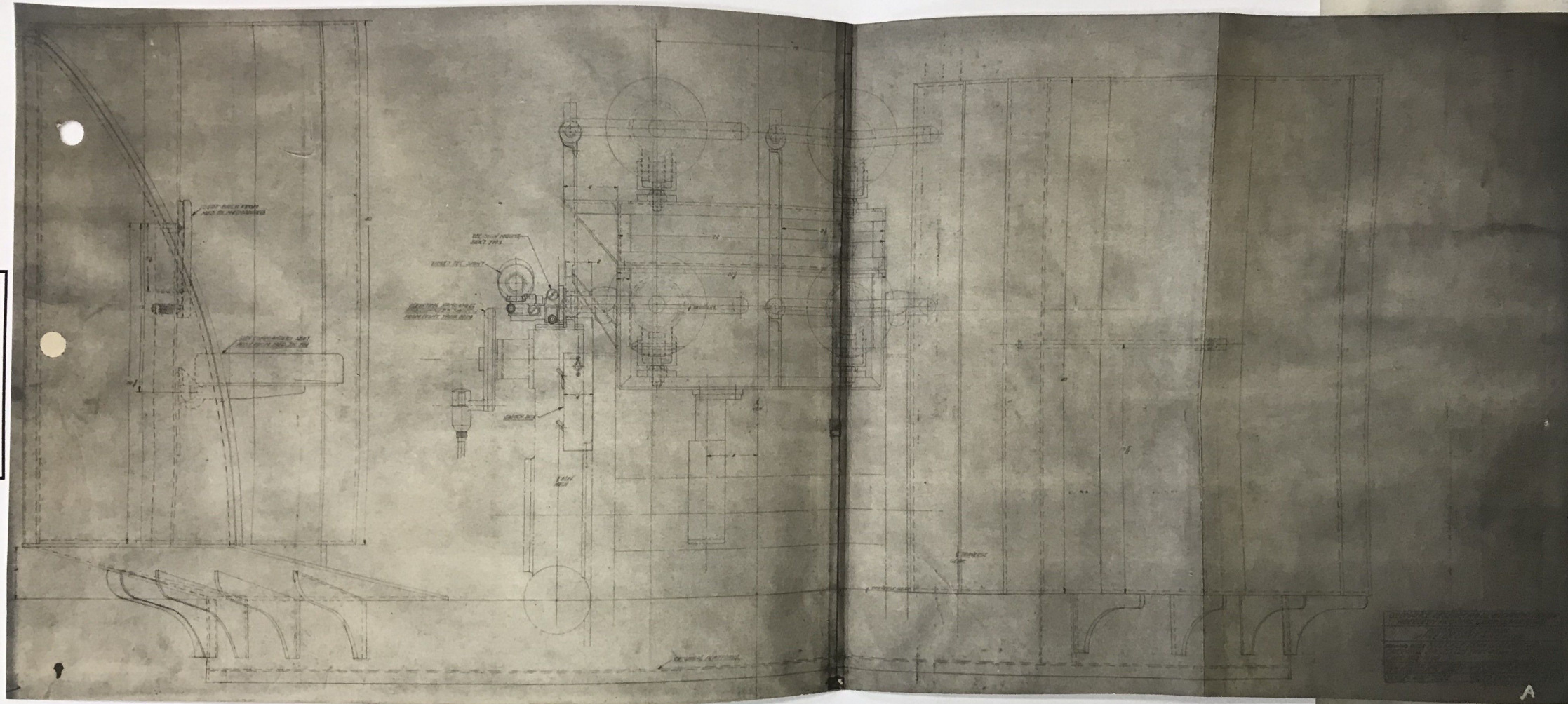
1. Inclosed is a copy of the firing tests conducted. Results indicate that the multiple mount of this type is worthy of further development.

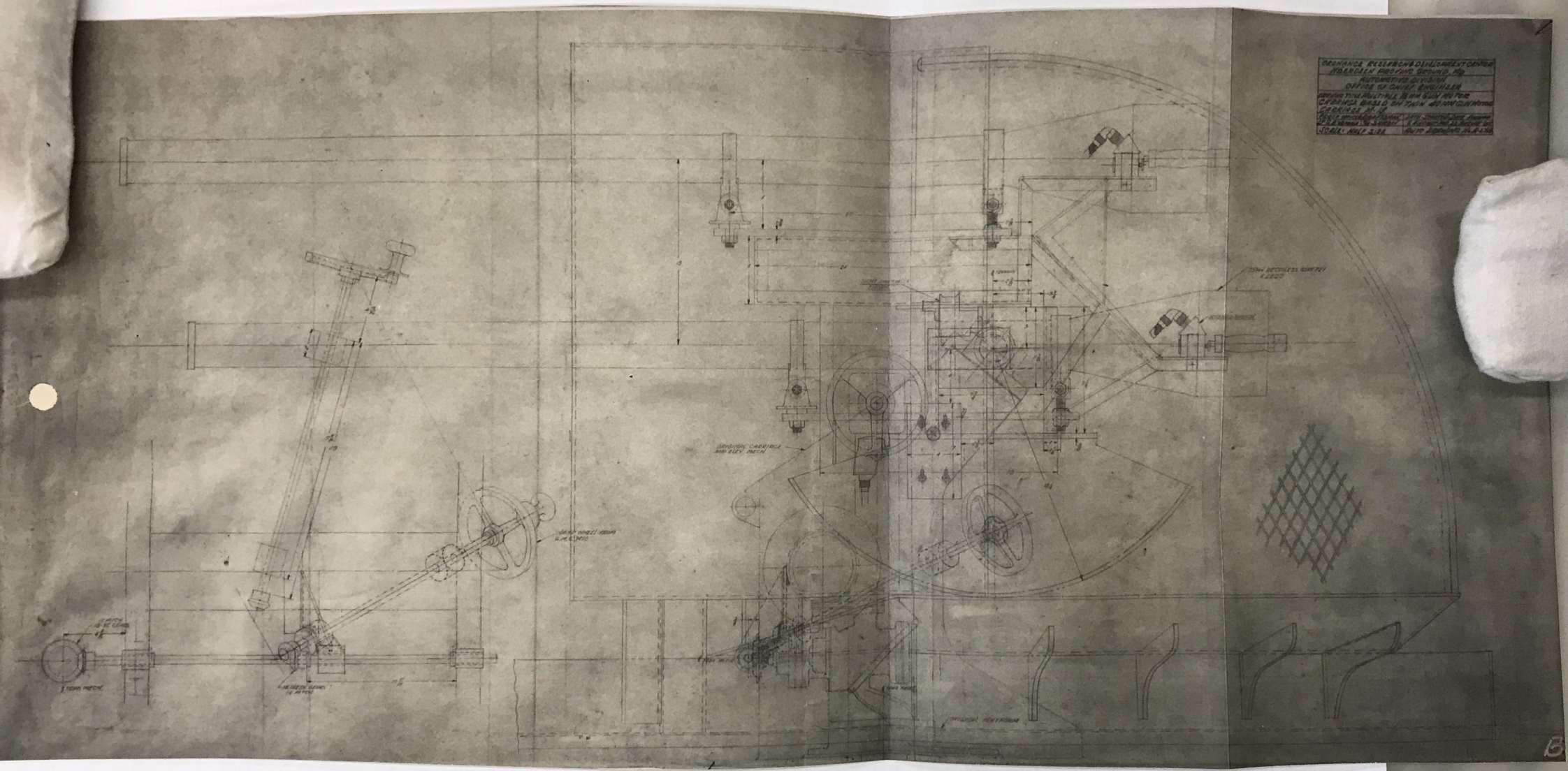
L. B. HOPKINS
Lt. Col., Ord. Dept.
Asst. Chief Engr., Comb. Veh.

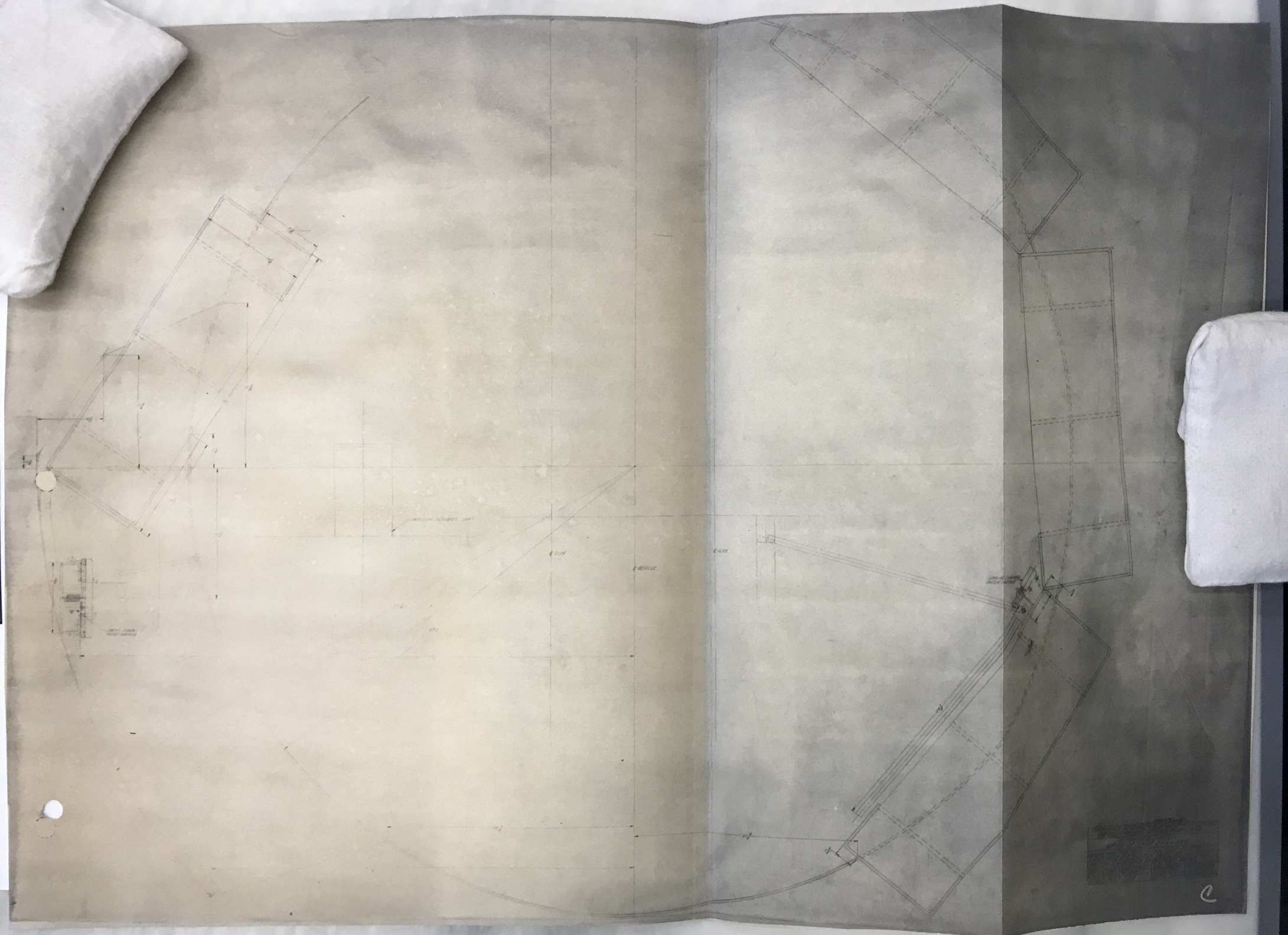
1 Incl:
Firing Test Report

APPENDIX C

DRAWINGS




ORDNANCE RESEARCH & DEVELOPMENT CENTER
ABERDEEN PROVING GROUND, MD
AUTOMOTIVE DIVISION
OFFICE OF CHIEF ENGINEER
CARRIAGE BASED ON TWIN 40 MM GUN MOTOR
CARRIAGE M19
SCALE: HALF SIZE
AUTO ORDNANCE M-4-X-10



APPENDIX D

CORRESPONDENCE

CONFIDENTIAL

Ordnance Research & Development Center,
Aberdeen Proving Ground, Md.,
19 June 1945

Memorandum to: Major General G. M. Barnes,
Chief, Research & Development Service,
Office of Chief of Ordnance,
Washington, D. C.

It is desired to mount four 105 Rifles on the M19 40 mm Gun Motor Carriage. We do not have a unit here that we can use to make such an installation. If you concur in this idea, it would be appreciated if you would have Mr. Beasley order in an M19 unit to be used for this purpose. We would like to fix this up for your demonstration on the 14th for General Hodges.

/s/ G. G. Eddy
G. G. Eddy
Col., Ord. Dept.,
Director, Ord. Res.
and Dev. Center

1st Ind

WFBeasley/jk
6423

ASF, Ord O, Washington 25, D. C. 28 June 1945

To: CG, Aberdeen Proving Ground, Md. ATTN: SPOTZ

1. Arrangements have been made with OCO-Detroit (Maj. H. G. English) for immediate shipment of one (1) chassis 40 mm Gun Motor Carriage, M19 on a loan basis for mounting of weapons referred to in the basic memorandum.

2. It should be noted that this vehicle is one of a production order which must be returned prior to 1 October 1945 for use in mounting the Twin 40 mm Gun Mount as originally intended.

/s/ W. F. Beasley
W. F. BEASLEY
Chief, Tank & Motor Transport Division
Research & Development Service

CONFIDENTIAL

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5 September 1945

9293

ORD., AUTOMOTIVE DIVISION, OMMC, COMBAT VEHICLE BRANCH SPOTZ-6

ABERDEEN PROVING GROUND, MARYLAND

CHIEF OF ORDNANCE, ASF

WASHINGTON 25, D. C.

ATTN: SPOIR - AA & PC BRANCH x

Project 6226-I/6-22-24

REQUEST DISPOSITION FOR TWIN 40 MM GUNS, RECOIL CONTROL MOTORS, AND MISCELLANEOUS EQUIPMENT REMOVED FROM TWIN 40 MM GUN MOUNT T1281, MD SPOTZ-6, Hepsala.

RUDY

OFFICIAL NOTIFIED

L. B. HOPKINS

LT. COL., ORD. DEPT.

43

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Project 6-22-24

UT 76

WTAREI

UTAO V WAOA NR 94 WD

FROM WEYHER WASHINGTON D CC OF ORD ASF 072158Z SEP 45

TO CO ABERDEEN P G MD

GRNC

ATIN SPOTZ-G

REURTT 26366 NR19 061245Z SEPT TWIN 40 MM GUN MT T12E1 INCLUDING FIRE CONTROL EQUIPMENT SHOULD BE DISPOSED OF AS SURPLUS IN ACCORDANCE WITH EXISTING REGULATIONS END CITE SPOIR WEST

072245Z

Petersen/hal
1st Memo Ind Ext. 4294

Arms & Ammunition Division, Ordnance Research & Development Center, 20 September 1945

TO: Lt. Col. E. Gray, Chief, Automotive Division

1. The different phases of the outlined test in the basic memorandum were discussed with Mr. Prevas of the Ballistic Research Laboratory. It was concluded that, for practical purposes, only the dispersion test of the Experimental Multiple 75 mm Rifle Mount fired in salvos, would be conducted. This firing is reported in A.P.G. Firing Record No. M-46432.

2. Before firing the Experimental Multiple 75 mm Rifle Mount for dispersion, the four 75 mm Rifles, T21 were removed from the mount. The bore alignment was checked and found to be straight in both the vertical and horizontal planes. The rifles were then fired in a pendulum to secure a uniform recoil length on each of the four rifles. Three-round groups were fired with each rifle after the proper choke ring size had been determined by preliminary firings. The following average recoil lengths with the resultant average muzzle velocities were obtained.

Rifle No.	Recoil Length of Rifle as Taken From Mount* - Inches	Average Recoil Length - Inches**	Choke Ring Size	Average Muzzle Velocity - f/s
850	+17	+4-1/4	1.44	966
836	+23-1/2	+6	1.42	957
880	+12	+6-1/2	1.44	968
490	+10-1/2	+6	1.46	966

* One round fired ** + = Rearward

3. The Experimental Multiple 75 mm Rifle Mount was fired for dispersion on a 16' x 16' vertical target at 1100 yards.

a. The rifles were positioned on the mount in the following order as viewed from the rear.

Rifle No.	Rifle No.
850	836
880	490

b. After the four rifles and the telescope sight had been boresighted on the center of the target, Rifle No. 850 was zeroed-in with four rounds. It was assumed that the other three rifles would then also be zeroed-in. An attempt was then made to fire a salvo; however only Rifles Nos. 850 and 880 fired as difficulty was experienced with improperly positioned and faulty solenoids on Rifle Nos. 836 and 490. This was corrected.

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TO: Lt. Col. E. Gray 20 September 1945

c. The points of impact of Rifles Nos. 850 and 880 showed that each rifle would have to be zeroed-in by firing, instead of bore-sighting them as a group if a close impact pattern was to be obtained even though each of the rifles had approximately the same recoil in a pendulum. After this was then done, the rifles were laying at the following elevations.

Rifle No.	Elevation Mils
850	53.5
836	51.5
880	53.5
490	55.7

The quadrant seat on the breech of the rifles had been checked beforehand and found parallel to the bore of the rifles.

d. Seven salvo groups were then fired at the same elevation as tabulated in paragraph 3c above. The weight of the propelling charges and projectiles (including fuze) had been checked, and the rounds grouped as evenly as possible with respect to weight, except the first group. Ammunition Lot LOP 9-4-X was used. Immediately before the firing of each group the fuzes of the projectiles were dipped in different colors of paint so that the points of impact of each rifle could be distinguished in order that the dispersion of each rifle could be determined as well as the overall dispersion of the four rifles.

(1) The rounds in the first salvo group contained a marked variation in the weight of propelling charges and projectiles which influenced the points of impact as follows:

Rifle No.	Proj. Wt. Pounds *	Propelling Charge - Wt. Ounces	Point of Impact From Center of Target - Inches
850	14.32	44.26	L10, hit 45 feet short of target
836	14.25	44.33	0, +67
880	14.25	44.30	L22, +22
490	14.22	44.35	L56, +75

* Includes fuze

The round in Rifle No. 490 with the lightest projectile and heaviest weight of propelling charge impacted 75 inches above the center of the target while the round in Rifle No. 850 with the heaviest projectile and lightest weight of propelling charge, impacted on the ground 45 feet

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in front of the target. This first salvo group was not considered in the computed dispersion data.

(2) The dispersion data for the succeeding six salvo groups was computed for each rifle and for the four rifles as a group and is contained in Inclosure 1.

4. In the course of the dispersion test of the Experimental Multiple 75 mm Rifle Mount, the following observations were noted.

a. An arrangement for the elimination of cant in the cradle of the rifle mount would be advantageous.

b. A mount of this type should be provided with a redesigned electrical trigger firing mechanism with suitable safety incorporated to provide synchronous firing of all four rifles when fired in salvos. Synchronous firing was not achieved with the present improvised solenoid firing arrangement. This was discovered from high speed motion pictures that were taken of the last three salvos. It is believed that synchronous firing of salvos will tend to improve the dispersion. Difficulty was also experienced in adjusting the present improvised safety releases to secure proper functioning of the trigger.

c. Elevation stops should be incorporated to limit the elevation/range to prevent the rearward blast from striking the platform of the mount with the rifles in elevation and to prevent projectiles from striking the forepart of the motor carriage in case of a premature or accidental firing with the rifles in depression.

d. It is believed that the deflection and elevation adjustments for the individual rifles could be more conveniently located and designed to facilitate adjustment when zeroing-in the rifles.

5. It is concluded that:

a. The dispersion of the Experimental Multiple 75 mm Rifle Mount is satisfactory.

b. Each rifle of this mount will have to be zeroed-in by firing instead of boresighting them in as a group on the same point.

c. A multiple mount of this type is worthy of further development.

/s/ C. R. Carr, Lt. Col.
for STUART McLAIN
Lt Col, Ord Dept
Chief
Arms & Ammunition Div

1 Incl.
Dispersion Data

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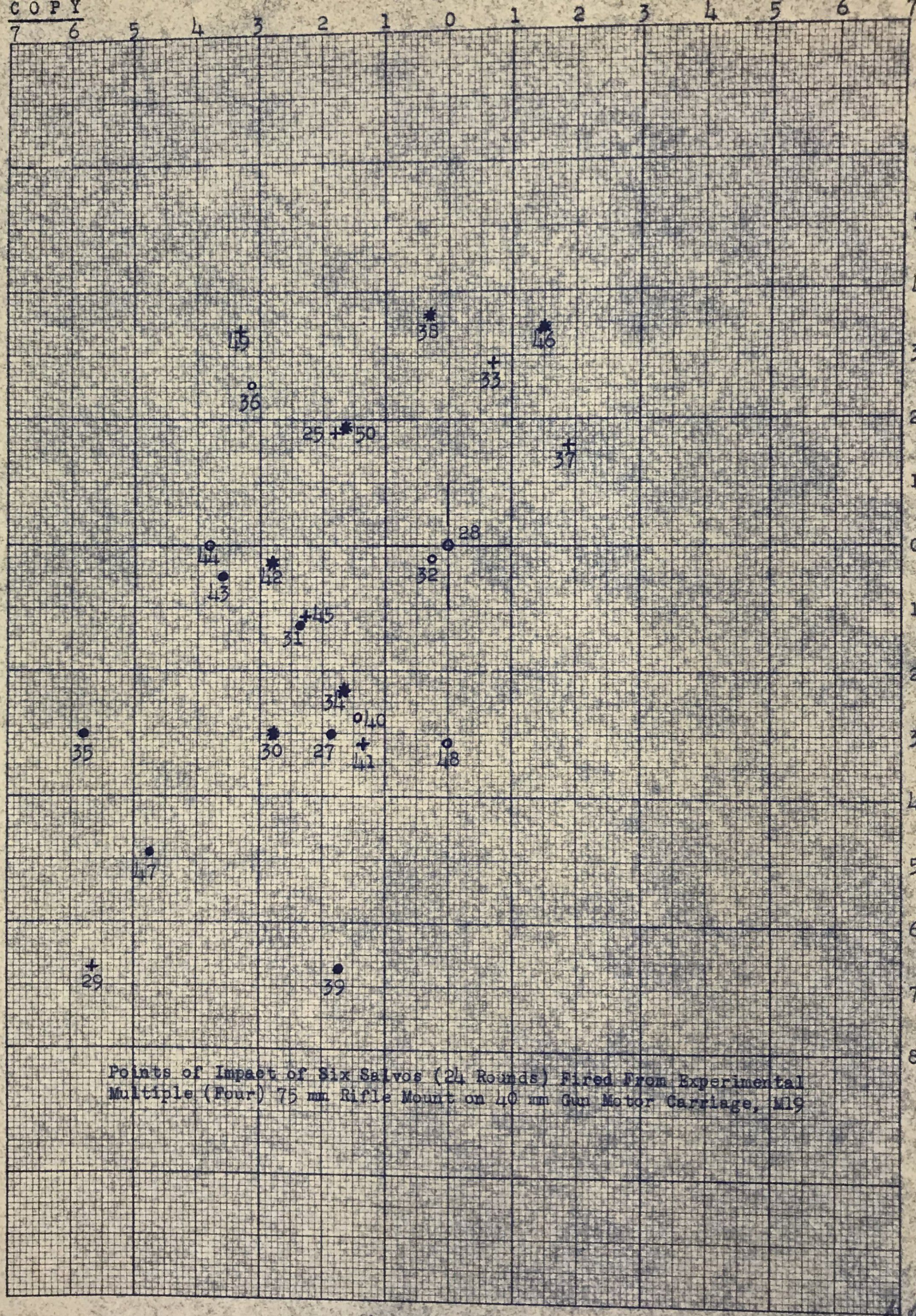

Points of Impact of Six Salvos (24 Rounds) Fired From Experimental Multiple (Four) 75 mm Rifle Mount on 40 mm Gun Motor Carriage, M19

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Dispersion Data on Experimental Multiple (Four) 75 mm Rifle Mount on 40 mm Gun Motor Carriage, M19

Dispersion of Six Salvos (24 rounds)

Maximum Horizontal Dispersion Inches	Maximum Vertical Dispersion Inches	Maximum Spread Inches	Center of Impact In Relation to Center of Target Inches	Probable Error in Inches	
				Horizontal	Vertical
93	124	149	L24, -12	16.7	24.8

Rounds in Each Salvo - Points of Impact on Chart

Salvo No.	Rounds
1	27-30
2	31-34
3	35-38
4	39-42
5	43-46
6	47-50

Dispersion of the Individual Rifles Used (6 rounds each)

Rifle No.	Choke Ring Size	Symbol of Designation of Points of Impact on Chart	Max. Horiz. Disp. Inches	Max. Vert. Disp. Inches	Max. Spread Inches	Elev. Mils	Center of Impact In Relation to Center of Target Inches	Probable Error in Inches	
								Horiz.	Vert.
850	1.44	●	48	74	77	53.3	L41, -39	13.9	19.4
836	1.42	o	46	67	77	51.5	L18, - 7	14.3	17.5
880	1.44	+	92	121	138	53.5	L21, - 7	23.6	33.3
490	1.46	*	53	79	93	55.7	L16, + 6	14.3	24.3

The 75 mm Rifle, T21 with T38 projectile and fuze M15A4 (Inert) was used in obtaining the above dispersion data.

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TABLE I

DISPERSION RESULTS

FIRING TEST OF FOUR 75 MM RIFLES ON TWIN 40 MM GUN MOTOR CARRIAGE M19

Range	Rifle No.	Rifle Position	Overall Dispersion, mils: 5 rounds Vert.	5 rounds Horiz.	Best 4 rounds Vert.	Best 4 rounds Horiz.
500 yds.						
	490	Upper left	1.5	0.6	1.1	0.4
	860	Lower left	1.9	0.8	1.2	0.3
	836	Upper right	3.4	1.7	0.4	1.1
	850	Lower right	2.5	1.1	0.7	1.1
		Average	2.3	1.1	0.7	0.7
1000 yds.						
	490	Upper left	1.3	0.6		
	860	Lower left	1.1	0.5		
	836	Upper right	1.5	1.3		
	850	Lower right	1.2	0.6		
		Average	1.3	0.8		